

The relationship between information acquisition and smartphone-using of elderly people in Western Rural China

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Abstract. Although overall Internet penetration in China continues to increase, smartphone penetration among rural elderly remains relatively low. What limits older people's in-depth development and use of smartphones as a new information channel is no longer economic factors but their information quality and needs. This paper takes rural elderly people as research subjects and investigates four villages in Xi 'an Shanxi Province. Combining a questionnaire survey with a semi-structured interview, this paper conducts an in-depth investigation in rural areas to understand the smartphone usage habits of rural elderly residents. The information acquisition mode of rural elderly smartphone users coexists with traditional and online information sources. They have not thoroughly discovered the functions of their smartphones. Therefore, rural elderly groups still suffer from information lag and have blocked knowledge organizations. This situation is expected to be improved by promoting knowledge sharing within the elderly group and introducing mobile phone knowledge popularisation.

Keywords: smartphone; rural elderly group; information acquisition.

1. Introduction

With the increasing popularity of smartphones, it has changed the model of information search and dissemination. [1] According to the 50th Statistical Report on Internet Development in China released by China Internet Network Information Center (CNNIC), As of December 2023, the number of Internet users in China was 1.092 billion, among which 1.091 billion were mobile Internet users. [2] However, there is still a gap between the urban and rural Internet user populations. According to statistics, rural Internet users account for only 29.8% of the total Internet users. On the other hand, the number of non-netizens is dominated by the permanent population in rural areas, and the proportion of non-Internet users in rural China is 51.8%. In terms of age, the elderly group aged 60 weighs 39.8% of the non-Internet population. The rural elderly group is undoubtedly least affected by smartphones in knowledge acquisition and information dissemination.

This research is in the domain of information acquisition behaviors. To explore the cause of low smartphone penetration among the elderly population in rural China, I conduct investigations and interviews about their Information search and acquisition habits. By investigating their information habits, I can summarise smartphone and internet popularisation strategies targeting the information acquisition habits of the elderly and accelerating the popularisation of mobile Internet in rural areas.

One of the most essential barriers for elderly people using smartphones is their education level. Rozelle S's research (2018) states, "In the 1980s, only urban children went to preschool; 70 percent of China's children sat at home until age 7." [3] My survey also shows that most rural elderly people do not receive a high level of education. As a result, they have a marginalized status in the Internet community, forming a relatively occluded subculture group with little communication with the mainstream Internet group. To understand the information acquisition patterns of elderly groups, I conducted a field questionnaire survey in Kangdu Village, Zhangkangdong Village, and Zhangkangxi Village, respectively. I obtained a total of 100 pieces of relevant data. Based on these data, this paper will focus on (1) investigating the popularity of smartphones among the elderly in rural China, (2) identifying the information dissemination pattern through the habit of using smartphones, (3) identifying the enablers and barriers of information dissemination, (4) summarising the strategies of promoting the popularisation of smartphones among the elderly and enabling knowledge transfer.

2. Data Acquisition

The first phase of the study was qualitative, applying an interpretive approach. I used a combination of questionnaire surveys and semi-structured interviews to conduct field investigations in Xiaojuan Village, Kangdu Village, Zhangkangdong Village, and Zhangkangxi Village around Xi'an City. After the survey, 120 questionnaires were collected, of which 100 were validated. Based on the data, this paper probes into the factors that influence the use of mobile applications by the rural elderly groups. Then, it analyses the restrictive aspects of the popularisation of smartphones and puts forward targeted countermeasures to promote the development of smartphone penetration in rural areas according to the existing problems.

3. Related Work

The study conducted by Yongjian, Shi, Li, & Wang (2015) summarised the situation of knowledge dissemination in Chinese rural areas. [4] It emphasized the importance of government participation and learning motivation in knowledge transfer. The complete infrastructure in rural China enabled knowledge dissemination through mobile internet.

Some scholars focused on the function of mobile medical healthcare applications among the elderly population. For example, Fitch, C. J., & Adams, C. (2006) emphasized the importance of mobile technology support from smartphones to community healthcare (CHC) provision. [5] Similar research has been conducted in India, as Rahar (2011) stated, "Despite many of these new mobile citizens live in poorer and more rural areas with low PC and internet penetration...Approximately 50%–60% of government services, including Primary Health Management, can be delivered via mobile channels." [6]

Although smartphones' function in disseminating information and knowledge is widely recognized, the ownership rate in rural areas is still low, especially among middle-aged and older people. According to the research conducted by Owusu, V. (2023), "The age of the farmer rather affects smartphone usage negatively and significantly...education, health condition, asset ownership, income levels are the main factors driving smartphone usage of rural farmers." [7]

Some scholars have explored the psychological impact of smartphones on rural residents. Despite the relatively low holding rate, Sousa-Poza (2021) emphasises, "The results reveal an association between smartphone use and increases in both life satisfaction and happiness that remains even after we adjust for possible endogeneity." Tang, L., and Luo, X. (2023) have conducted a similar study. They dig deep into the mechanism of smartphone use influencing farmers' decision-making in public service. The results show that "Smartphone use can increase the willingness to participate in centralized treatment of rural domestic sewage (WTP-RDSCT) by an average of 29.6%, and there is a positive correlation between use intensity and WTP-RDSCT." [8]

According to the research above, smartphones have been researched for their function in information dissemination and decision-making among rural citizens. However, the effects of smartphones on rural elderly people's information acquisition channels and mechanisms have not been studied in depth. Given the massive outflow of the rural population as China's urbanization progresses, "The permanent population of 12 villages accounts for less than 50% of the registered population...and population over 60 years old accounts for 30% of the total population." [9] Since the middle-aged and elderly population is becoming an increasing proportion of the rural population, figuring out their information acquisition mechanism through smartphones and developing corresponding information channels and policies can contribute to information dissemination in rural China and provide emotional care for the elderly. At the same time, data analysis can help understand the information acceptance of elderly people in rural left-behind groups. It can also suggest ways to improve rural governance and elderly care.

4. Data analysis

The interviewees were selected from Xiaojuan Village and Kangdu Village, Chang 'a District, Xi 'a City, Shaanxi Province. One hundred valid questionnaires were received, and twelve semi-structured interviews were also conducted.

4.1. Overview of the data

From the perspective of age and demographic characteristics (as shown in Table 1), the overall education level among older adults is not very good. Only 50% of the elderly population are educated beyond primary school. It is not difficult to infer from this situation their information literacy is relatively weak in learning how to use smartphones and other new means of obtaining information. Thus, their colleagues at work and their children will be important sources of information. In this process, the age of the elderly, their ability to accept information, and the information literacy of their children will significantly affect their information literacy.

Table 1. Demographic characteristics

Items	Number	percentage(%)
Gender		
Male	48	48
Female	52	52
Age		
40-50	34	34
51-64	47	47
> 65	19	19
Living companion		
Mate	28	28
Single or Widowed	16	16
Living with kids	55	55
others	1	1
Educational level		
Never go to school	20	20
Primary school	31	31
Junior Middle School	43	43
Senior middle school and above	6	6
Working status		
at Work	75	75
retire	25	25
Children's situation		
No children	3	3
Children at school	21	21
Children at work	75	75
Bereavement and other	1	1

From the intuitive data, we can see from Figure 1 the relationship between age and smartphone ownership. Among people over 65, there are significantly more people with low education experience. Low information literacy and learning ability increase the learning cost to use smartphones, which partially affects their smartphone ownership rate.

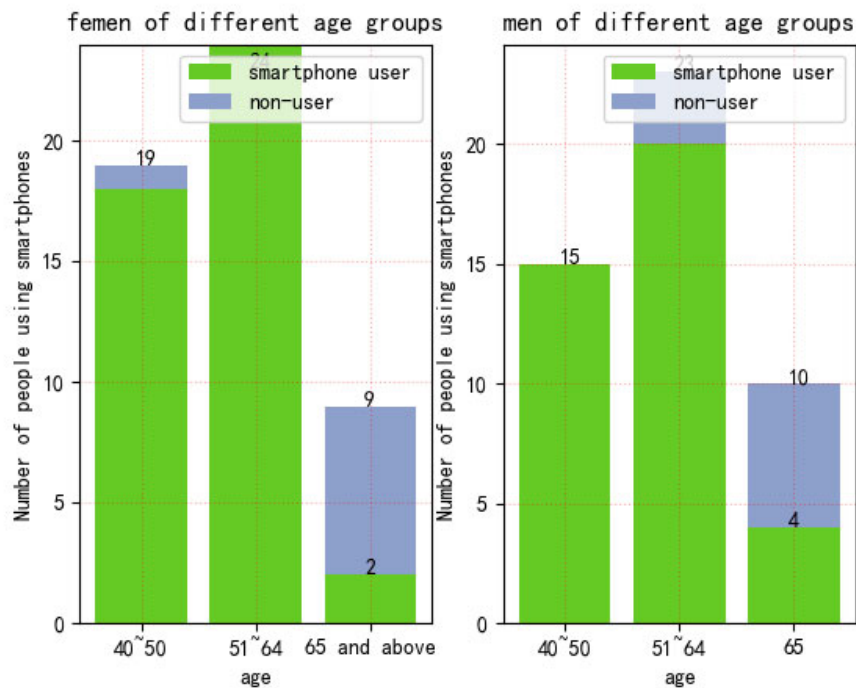


Figure 1. Number of smartphone users among different age groups

4.2. the interaction between information needs and the number of smartphones

At the same time, education level and working status also affect the ownership rate of smartphones. In this study, to generate a more differentiated picture of the education-working status-smartphone ownership relation, I employ both indicators, assessed by the survey questions “What is your income from work/ pension?” (measured on a 5-point scale from 1 = meager income to 5 = very high income) and “What is your level of education?”. (measured on a 5-point scale from 1 = never went to school to 5 = above senior high school)

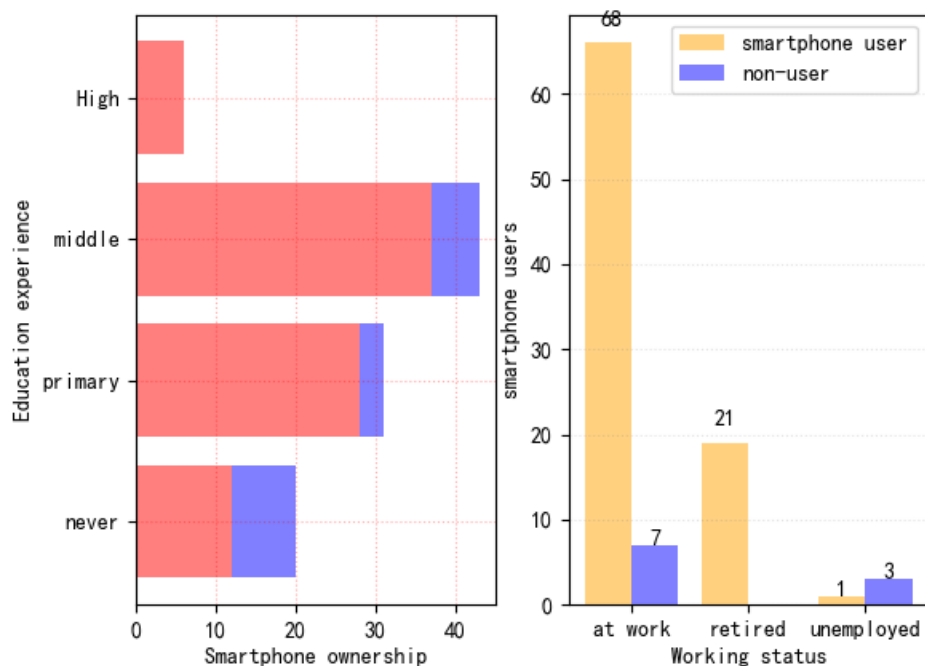


Figure 2. Number of smartphone users among different education & working status groups

To measure factors affecting smartphone ownership, I set “do you own a smartphone” (1 = yes and 0 = no). Age, work status, and education experience are input into the Linear Regression model as independent variables for training. More specifically, we apply a Linear Regression estimation based on the following model:

$$Y = \beta_0 X_0 + \beta_1 X_1 + \cdots + \beta_n X_n$$

Where Y denotes the subjective fact of whether an interviewee owns a smartphone, the results show that age is related to a 1.75 negative correlation in smartphone ownership and education experience, and working status is related to a 0.07/0.08 positive correlation in smartphone ownership, respectively.

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In [70]: print('w0:', lr.intercept_)
print('w1, w2, w3:', lr.coef_)

w0: [1.64732748]
w1, w2, w3: [[-1.75772044  0.0732271  0.08432394]]

In [71]: df_X = df_used.drop(columns=['WETHER USE SMARTPHONE'])
df_y = df_used[['WETHER USE SMARTPHONE']]

####WETHER USE SMARTPHONE=1.64732748-0.175AGE+0.07EDUCATION+0.08*WORK
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Figure 3. Linear Regression results about the relationship between age, education, work, and smartphone ownership

From this, we can conclude that educational experience and work status give the elderly information literacy and acquisition needs, urging them to own mobile phones. Academic qualifications and education experience are no longer the main obstacles restricting the use of mobile phones by middle-aged and older adults in rural areas. On the contrary, the information literacy provided by educational experience is their motivation to use smartphones, which can also be seen from the daily time spent on smartphones. 100% of respondents with high school education and above use mobile phones. At the same time, there is no noticeable difference in the proportion of mobile phone users among interviewees who have graduated from primary school and middle school. Job and income also have a minor impact on smartphone ownership, meaning that price isn't the primary concern for the rural elderly group when buying a smartphone.

However, it must be noted that although the learning experience is no longer a hard threshold for using smartphones, it may influence smartphone usage time. As shown in Figure 3, the most significant proportion of heavy users who use mobile phones for six hours or more a day are those with primary and junior high school education. Time spent using mobile phones is also affected by work status. Overall, working and well-educated rural elderly groups have higher information needs and use mobile phones longer. In addition, emotional needs and recommendations are also essential reasons why these elderly people buy smartphones.

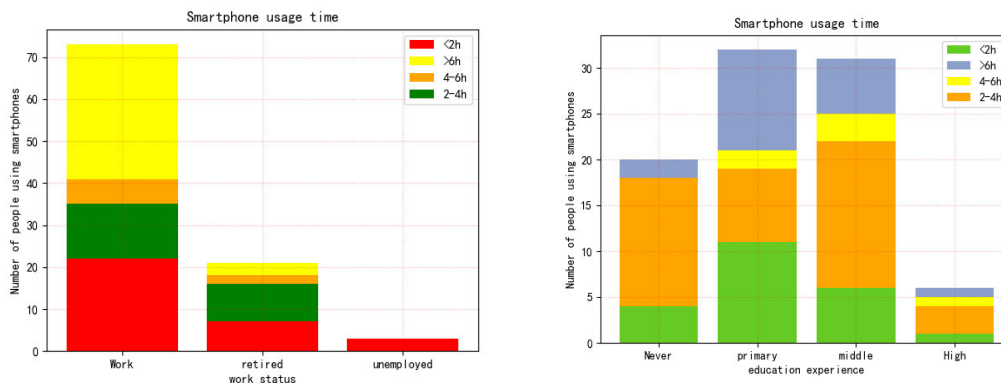


Figure 4. Distribution of time spent using mobile phones by different educational backgrounds/work status

4.3. Emotional needs of the elderly

The survey data shown in Figure 4 shows that elderly people in rural areas are not deeply involved in digging their smartphones' functions. Most of them only use a few particular applications on their mobile phones. Some interviewees said they only use simple functions such as WeChat and phone calls.

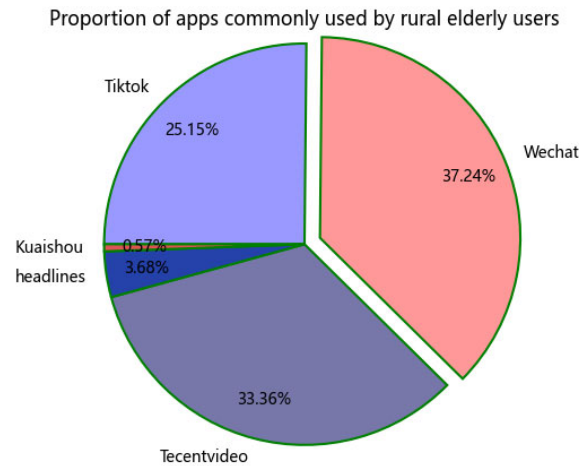


Figure 5. Proportion of apps commonly used by rural elderly users

The main reason for this situation is that the elderly rely heavily on face-to-face knowledge transfer from their children and colleagues to learn how to use smartphones. Through interviews, I understand this phenomenon is particularly evident among the elderly with low education levels. These people fail to explore all the functions of their smartphones and rely heavily on particular information channels to acquire the necessary knowledge. Most of these information channels are short video websites, communication apps, and other software used to relieve the loneliness of the elderly.

In the survey on the relationship between loneliness and mobile phone usage, 30% of the respondents said they often feel lonely and increase their time using their mobile phones. Those who never feel lonely are more likely to have their hobbies or are more inclined to engage in entertainment in the real world. It is worth noting that loneliness is particularly related to the companionship of the elderly, which is more severe for the elderly whose children are working. Due to the lack of information dissemination from their children, it is challenging for these elderly people to expand information acquisition channels through smartphones.

According to the survey, rural elderly people fail to use smartphones to expand information channels, which should arouse our attention to knowledge transfer and expand the information channels of the elderly. In short, systematically introducing the operating methods of smartphones to the elderly can help them try to use more apps and expand their information channels. However, this type of knowledge sharing and expansion requires the intervention of volunteer organizations and external forces. In short, smartphones haven't expanded many information channels for elderly people. Rural elderly mobile phone users are eager to expand their social circles on the Internet but lack the necessary knowledge to reach their goals.

4.4. The impact of smartphones on traditional information channels

In the survey, parties, chatting, and watching TV are the traditional entertainment and information exchange modes for rural elderly people. As shown in Figure 5, acquiring information from smartphones has become increasingly popular among the elderly. Although only a few mobile

applications are widely used, smartphones still expand the share of traditional information acquisition methods. What followed was an expansion with the birth of virtual elderly communities.

Rural entertainment activities and information exchange methods

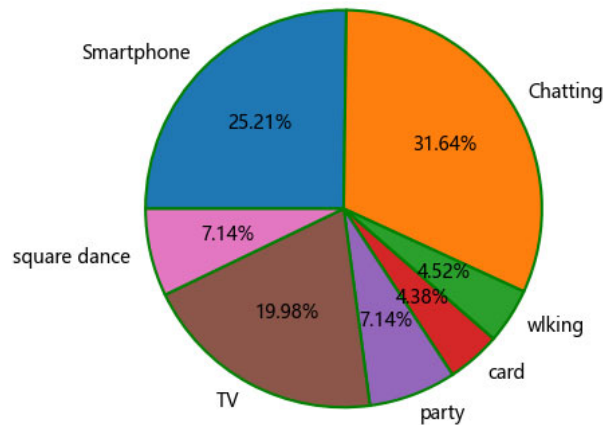


Figure 6. Rural entertainment activities and information exchange methods

It is worth noting that chatting, square dancing and rural parties all have strong geographical restrictions. Blood ties characterized the information organizations established through these activities and limited their boundaries.

From this perspective, the continuous popularity of smartphones has a far-reaching influence on the information dissemination ecology of traditional rural elderly people. The most intuitive reflection is that with the prosperity of virtual communities, online fraud information has become more widely spread among elderly communities. According to the survey, 35% of the respondents said they could not identify some information on the Internet, and 17% of the respondents had encountered online fraud. In face-to-face interviews, two interviewees admitted that they had been deceived. Many interviewees said they relied heavily on their children's judgment to avoid being defrauded. It can be seen that the popularity of smartphones has not only broadened the channels for obtaining information but also promoted the spread of misinformation. The elderly group's reliance on a single app also reduces their ability to verify the validity of information by comparing information on different mobile platforms. Therefore, the information acquisition model of rural elderly groups shows the characteristics of online acquisition and offline verification.

From this perspective, the widespread use of smartphones has changed traditional rural information exchange activities such as walking together, playing cards, and chatting. Smartphones have formed a complementary information verification mechanism with traditional information communication channels, but elderly people lack the information literacy to judge the authenticity of information obtained from smartphones.

Therefore, to strengthen the diffusion of information in rural areas, it is necessary to enhance the information literacy and judgment ability of the elderly. Given the current situation where a large amount of information and misinformation coexist in the new information channels brought by smartphones, new information verification strategies and policies must be developed.

5. Conclusion

In the previous sections, through a questionnaire survey and data analysis, I found that the possession rate of smartphones by the elderly in rural China is not mainly restricted by price but mainly by the learning costs of using smartphones and information needs. It is worth noting that the elderly's

information needs and the cost of smartphone learning mostly depend on their education level and social contacts. 43% of the interviewees said they use smartphones because of recommendations from relatives and friends, and they mainly use apps such as WeChat to communicate with relatives when purchasing smartphones. Only 28% of the interviewees learned how to use smartphones independently.

From this perspective, smartphones, as a new information channel for rural elderly groups, strongly depend on interpersonal information channels.

Given such a situation, knowledge organizations that allow villagers to share knowledge in face-to-face interactions are critical in promoting smartphones among rural elderly people. Due to the outflow of young people from rural China, the elderly need new information channels to keep in touch with the outside world. However, the flush of misinformation on the Internet is a significant obstacle that prevents the elderly from using smartphones. The knowledge organization among the elderly cannot effectively judge the validity of the huge flow of information on the Internet. Thus, the interference of voluntary groups and local governments is needed to secure information. Network supervision departments and social media operators should indicate the source of information and spread information security knowledge through publications and NGOs.

At the same time, the government can cooperate with some mobile app manufacturers to form a social media training team to help rural groups improve their mobile phone operation skills. By developing simplified versions of applications, the government can make it easier for the elderly to explore new information sources.

5.1. Increase the inherent information needs of the elderly

Affected by age, educational level and other factors, the information needs of elderly people in rural China mainly come from informal knowledge organizations and interactions between companions and family members. Generally speaking, most elderly people lack the endogenous motivation to explore new information channels. Without the knowledge input from their children and friends, most will maintain their existing information acquisition patterns, even if some operations appear cumbersome.

At the same time, the frequent occurrence of online fraud cases and related rumours has caused elderly people to distrust mobile information channels, thus reducing their demand for online information. For example, if they cannot judge the truth of social media information, they will avoid using social media to reduce or eliminate network risks.

According to the questionnaire and interview results, 27% of the interviewees learned about social media use through their children. Their children's assistance with the elderly played an essential role in helping the elderly use smartphones and arousing elderly people's awareness and use of social media. Therefore, young people must interpret and spread mobile phone knowledge to older generations to introduce new information acquisition channels in rural China. By addressing older generations' concerns about the availability of online information and increasing online interactions among older adults, older adults' information needs can be increased.

5.2. Promote self-renovation of rural knowledge organizations

Smartphones' new information channels can not only alleviate the loneliness of the elderly caused by population outflow but also provide life-long learning channels for them. By learning new knowledge and skills from the mobile internet, rural informal organizations with low levels of education can develop new skills and hobbies. This can provide long-term assistance for elderly people and promote regional knowledge sharing.

It is worth mentioning that in rural China, blood ties and geographical distance are still constraints for boundary-less knowledge organizations. Promoting the development of smartphones as an information exchange channel will help break this boundary. Knowledge organizations that ignore

geographical and blood restrictions can be established through the mobile Internet. Establishing and joining these knowledge groups can help develop rural elderly communities and broaden the scope of information dissemination and communication.

As a marginalized group in Chinese society, the rural elderly are known as not well-informed. As stated by Hu Yixuan (2024), “Since the elderly in rural areas generally have narrow information channels...Loneliness and isolation are the biggest problems for those left behind.” Smartphones and the mobile Internet can help them connect with the world and let their voices be heard.

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